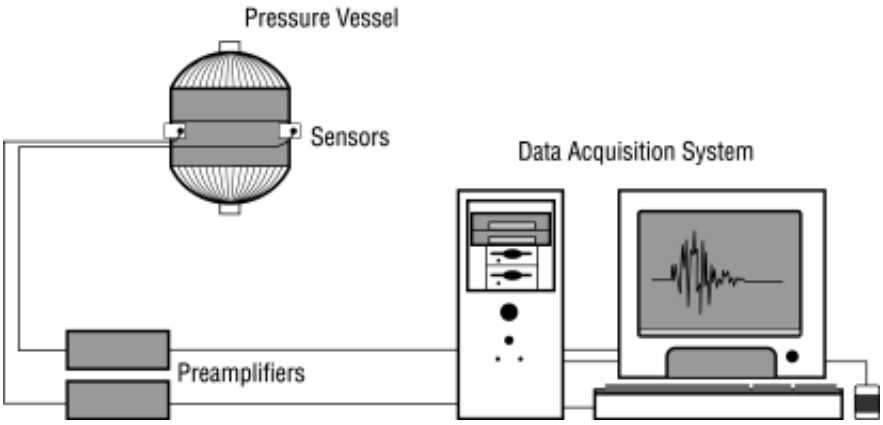
Acoustic Emission Facility

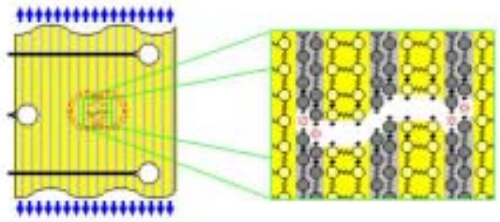
Purpose:

To better monitor the performance and quality of critical, low margin, structures by researching the applications of acoustic emmision (AE) nondestructive testing for advanced composite structures.

Acoustic emission nondestructive testing evaluates the ultrasonic sounds emitted by a structure as it is loaded. For most composite materials these sounds begin early in the loading cycle as a result of microdamage propagation from such failure modes as fiber/filament breakage, resin microcracking and delamination. The amount and severity of these modes early on in loading have been shown to be directly related to the overall quality of the composite and ultimately its failure loading condition. By monitoring these initial acoustic emissions, or lack of such, the quality of the structure can be obtained. Where all other nondestructive evaluation methods can only give the geometry of a suspected defect, AE measures active damage propagation, or in other words, defects that are truly detrimental to the performance of the structure.



The acoustic emission facility at MSFC has the capability with its four independent acoustic emission systems to monitor over sixty channels of acoustic activity. Both waveform and parametric AE data can be collected and analyzed with the systems. Advanced post processing software is available for linear, planar and 3-dimensional source location, soft computing (genetic algorithms and artificial neural networks) and statistical based data classification/sorting. Sensors are available for testing both metals and composites from cryogenic temperatures (-400 °F) to pyro temperatures (1000 °F). The facility also has a small load frame capable of applying quasi-static loads up to 30,000 pounds for stimulation of AE signals from material coupons for signal characterization.



Projects at MSFC using this technique worked at MSFC include the DC-XA liquid hydrogen tank, Spacelab Transfer Tunnel Extension, X-33 liquid hydrogen tank, Bantam RP-1 tank as well as many subscale pressure vessels. This faciltiy is located in Building 4711.

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